

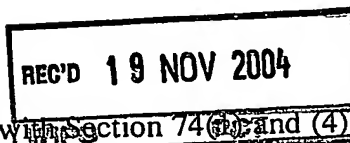


GB04/4473



INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

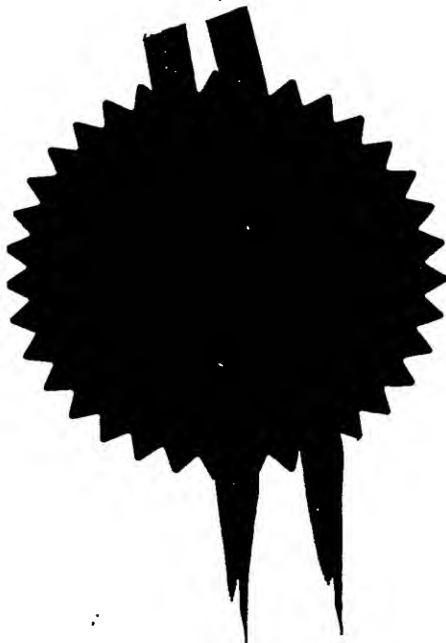


I, the undersigned, being an officer duly authorised in accordance with Section 74(3) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed *[Signature]*

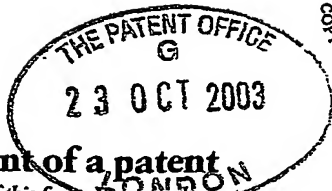
Dated 1 November 2004

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH
RULE 17.1(a) OR (b)

BEST AVAILABLE COPY

Patents Form 1/77

Patents Act 1977
(Rule 16)



24OCT03 E846886-1 000001

P01/7700-0-00-0324755.8

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

23 OCT 2003

1. Your reference 9851 GB SMS

2. Patent application number
(The Patent Office will fill this part in)

0324755.8

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Arjo Wiggins Limited
St. Clement House
Alencon Link, Basingstoke,
Hampshire, RG21 7SB

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

Great Britain

07455553002

4. Title of the invention Pressure Sensitive Record Material

5. Name of your agent (if you have one)

Abel & Imray

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

20 Red Lion Street
London
WC1R 4PQ

Patents ADP number (if you know it)

174001 ✓

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application

Date of filing
(day / month / year)

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Yes

Answer YES if

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

Patents Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form 0

Description 8

Claims(s) 3

Abstract 0

Drawing(s) 0

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for a preliminary examination and search (Patents Form 9/77)

Request for a substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature(s)

Abel & Imray

Abel & Imray

Date 23 Oct. 2003

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom

Sue Scott 020 7242 9984

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

- a) If you need help to fill in this form or you have any questions, please contact the Patent Office on 024 58509505.

PRESSURE SENSITIVE RECORD MATERIAL

5

This invention relates to paper for carbonless copy paper sets and to copy paper sets made up using it.

Carbonless copy paper sets consist of a top sheet known as
10 the CB (coated back) sheet, a back sheet known as the CF
(coated front) sheet, and optionally one or more intermediate
sheets known as CFB (coated front and back) sheets. The
coatings of the back of the CB sheet, of the front and back
of the CFB sheets if any, and of the front of the CF sheet
15 contain materials that when brought into association with
each other develop a coloured image. The sheets are
generally bonded together by an edge padding adhesive.

When the front of the CB sheet is typed on or otherwise
20 pressure imaged, material is transferred between the back of
one sheet and the front of the next through the set to give
rise to the copies required. Usually, a solution of a dye
precursor or "colour former" carried on the sheet as isolated
droplets each confined within a pressure rupturable barrier,
25 is transferred from the back of one sheet to the front of the
next after rupture of the barrier by the applied pressure,
and interacts with a "colour developer" present there to give
the image.

30 Electrophotographic printers, such as laser printers, use
high temperatures to fuse the toner used for printing, and
the paper used in these printers needs to satisfy a number of
challenging criteria, for example good toner adhesion, image
quality, dimensional stability and curl. For the HP/Indigo

system the paper surface has to be compatible with the ink to give ink acceptance and adhesion. It is especially difficult to provide carbonless copy paper sets which meet all these criteria, and which in addition have satisfactory edge padding characteristics.

EP 274886A describes an improved CB sheet, which comprises a paper sheet having on its front a printable pigment coating and on its back isolated droplets of colour former solution each confined within a pressure rupturable barrier, wherein the pigment coating comprises a binder for the pigment together with a specific synthetic reactive sizing agent or a specific coating structure agent or both. Preferably, in order to reduce curl during the coating process used in the manufacture of the coated product of the invention of EP 274886A, the Bendtsen porosity of the finished CB coated sheet is not less than 25ml/min, preferably not less than 30ml/min, with a typical range of 35-50 ml/min. Such porosities reflect porosities before CB coating of around 30 ml/min. or more allowing economic application of the CB coating.

In use, the CB sheet described in EP 274886A gives good performance when used in litho printers, but not in laser printers: although good toner adhesion, image quality, edge padding, and HP/Indigo ink acceptance and adhesion are achieved, excessive curl of the paper occurs after fusing.

We have now found that, surprisingly, a high porosity before

100ml/min prior to CB conversion results in a sheet which does not curl when used in electrophotographic printers.

Accordingly, the present invention provides a sheet product
5 comprising a paper sheet having on its front a printable coating comprising a pigment and a binder, and on its back isolated droplets of colour former solution each confined within a pressure rupturable barrier, characterised in that the paper sheet carrying said pigment/binder coating has a
10 Bendtsen porosity in excess of 100ml/min, preferably in excess of 120ml/min, prior to the application of the droplets of colour former solution.

The invention also provides a carbonless copy paper set which
15 includes at least a CB sheet and a CF sheet, in which the CB sheet is a sheet product according to the invention.

The invention further provides the use of a coating comprising a pigment and a binder and having characteristics
20 such that when used in a sheet product as a coating on the front of a paper sheet having on its back isolated droplets of colour former solution each confined within a pressure rupturable barrier, the paper sheet product carrying said pigment/binder coating has a Bendtsen porosity in excess of
25 100ml/min, preferably in excess of 120ml/min, prior to the application of the droplets of colour former solution; said use being to reduce curl following printing of the sheet product using an electrophotographic printer.

30 The composition of the pigment/binder layer is the main factor determining the Bendtsen porosity of the sheet product according to the invention. Bendtsen porosity should be understood to be the porosity of the sheet product when measured by ISO test method number ISO 5636 (part 3).

Preferably the pigment/binder coating includes a synthetic reactive sizing agent or a coating structure agent or both, the sizing agent preferably being an alkyl ketene dimer, 5 alkenyl succinic anhydride, polyurethane, or other synthetic reactive size, and the coating structure agent preferably being a carboxy methyl cellulose, a soya or other protein, an alginate, or other hydrophilic polymer. The relative amounts of components in the coating are desirably by weight 0.5-10 10 parts (advantageously 0.5 or 1 up to 5 parts) size and 0.5 - 5 parts) size and 0.5 - 5 parts coating structure agent, together with 60 - 95 parts pigment and 5 - 30 parts preferably 10 - 30 parts and advantageously 16 - 22 parts binder or, where the coating structure agent is present 15 without size, 75 - 82 parts (less desirably up to 85 parts) pigment, and 15 - 22 parts (less desirably down to 12 parts) binder.

The pigment used is, generally, a conventional paper coating 20 pigment, in particular an inorganic or mineral-derived particulate material. Mixture of pigments may be used. Calcium carbonate especially is economic and suitable, giving good whiteness and purity and having good printing characteristics, and either ground calcium carbonate or 25 precipitated calcium carbonate or a mixture may be used.

~~Other suitable pigments, which may be used alone or in~~
admixture with calcium carbonate, include coating clays such as china clay (kaolin), calcined clays, titanium dioxide, finely divided carbon and iron. Small quantities for

preferred because this provides the best combination for coating structure necessary to yield the desired porosity characteristics.

- 5 The particle size of the pigment is selected in order to provide the desired porosity of the sheet product, and is preferably in the range of from 1 to 10 microns, especially 1 to 5 microns. Ground calcium carbonate in which up to 70% of the particles, preferably up to 60% of the particles, have a
10 particle size of less than 2 microns, optionally in admixture with precipitated calcium carbonate, is preferred.

Particle sizes are as measured by a laser particle sizer such as the standard Malvern 3600 E Type. For particles of
15 broadly the same dimensions in any direction, such as those of calcium carbonate, such sizes approximate actual sizes; for flat or elongated particles such as those of coating clays the particle sizes as measured are nominal. The laser instrument assesses particle size by measuring the
20 interference pattern arising from diffraction of the laser light illuminating a sample suspension e.g. in water of the particles. The pattern is manipulated by a computer to give results as particle size by volume, e.g. the volume itself or the diameter of spheres of equal volume.

25

The binder may be selected from among those conventional in themselves in paper coating technology. In particular it may be synthetic rubber latex such as styrene butadiene latex (normally a carboxylated grade to give good dispersibility
30 and stability in water) or styrene acrylic latex. It is also however possible for it to be example an ether derivative of starch.

The size, if present, will typically be a neutral reactive size such as an alkyl ketene dimer or alkenyl succinic anhydride with the alkyl or alkenyl groups from C₈ upwards, generally from C₁₂ upwards, with C₁₅ - C₁₈ typical and the upper limit determined, for example at C₂₄, by mix workability and suitability of the final coating for printing. Such sizes, in which "neutral" connotes effectiveness as sizes at neutral coating mix pH, are effective in small quantities and readily provide acceptable rheology in the coating process, for example blade, roll or slot (extrusion) coating. Other synthetic sizes such as polyurethane sizes may however be used. Amounts within the ranges given earlier are typically 1 to 5% dry weight of the coating but more usually 1 to 2% will be used.

15

Coating structure agents which may be used if desired include in particular carboxy methyl cellulose such as is used in coating technology as a dewatering control. Other suitable materials are proteins, such as soya protein, and alginates such as sodium alginate. The optimal amount used depends on the nature of the material - enough to be effective but not so much as to increase viscosity or modify the rheology to make the mix uncoatable. Preferred amounts are typically, weight % on coating:-

25

Carboxy methyl cellulose

High mol.wt 0.5 - 1.5%

Medium mol.wt 1 - 2%

Low mol.wt 2 - 3%

Sodium alginate 0.5 - 1.5%

Other proteins

brightening agents, dispersants for the pigment(s), lubricants (e.g. calcium stearate) or antifoams.

Adjustment of the coat weight of the pigment/binder topcoat is important in order to obtain the required porosity. The coat weight may conveniently be from 2 to 10 g/m², advantageously 3 to 8 g/m².

The solids content of the coating mix is preferably from 25 - 75% solids, especially 30 - 70%, advantageously 50 - 65%.

The following Example illustrates the invention.

Example

15

Top coated 90g base paper was manufactured on a production paper and online blade coating machine. For the control a standard topcoat formulation was used and coated at approximately 7.5gsm. For the trial a higher porosity mix formulation was used and coated at 5.5gsm. These papers were then offline CB coated on the opposite side of the paper using a production roll coating machine to make a carbonless CB product. The trial and control CB were then converted to A4 sheets and tested for hanging curl by running through a Xerox Docutech (Trade Mark) printing system.

25

Details of the control and trial top coat mix formulations are given in Table 1.

Table 1

Material	Dry Wt %	
	Control	Trial
Carbital C75 (ground calcium carbonate having 75% of particles with particle size less than 2 microns)	86.4	
Carbital C60 (ground calcium carbonate having 60% of particles with particle size less than 2 microns)		43.2
PCC (precipitated calcium carbonate)		43.2
CMC (carboxy methyl cellulose)	0.9	0.9
Latex	12.7	12.7

The Bendtsen porosity of the product in the control
 5 experiment was 60 ml/min, while the porosity of the product according to the invention was 120 ml/min.

Post electrophotographic print hanging curl and print results
 after printing on a Xerox Docutech (Trade Mark) printing
 10 system were as follows:

Control: Post print hanging curl = >100 towards the CB side -
 caused many jams and turned corners in the machine

Trial: Post print hanging curl = 50 towards the CB side - ran
 15 without jams or turned corners.

Claims

- 5 1. A sheet product comprising a paper sheet having on its front a printable coating comprising a pigment and a binder, and on its back isolated droplets of colour former solution each confined within a pressure rupturable barrier, characterised in that the paper sheet carrying said
- 10 pigment/binder coating has a Bendtsen porosity in excess of 100ml/min prior to the application of the droplets of colour former solution.
2. A sheet product according to claim 1, characterised in
- 15 that the paper sheet carrying said pigment/binder coating has a Bendtsen porosity in excess of 120ml/min prior to the application of the droplets of colour former solution.
3. A sheet product according to either claim 1 or claim 2,
- 20 in which the pigment/binder coating includes a synthetic reactive sizing agent or a coating structure agent or both.
4. A sheet product according to claim 3, the sizing agent being an alkyl ketene dimer, alkenyl succinic anhydride, or a
- 25 polyurethane, and the coating structure agent being a carboxy methyl cellulose, a protein, or an alginate.
5. A sheet product according to either claim 3 or claim 4, in which the size if present is present in the pigment/binder
- 30 coating in an amount of from 0.5-10 parts by weight, and the coating structure agent if present is present in the pigment/binder layer in an amount of from 0.5 - 5 parts by weight.

6. A sheet product according to any one of claims 3 to 5, which contains carboxy methyl cellulose.
7. A sheet product according to any one of claims 1 to 6, in which the pigment is selected from calcium carbonate, china clay (kaolin), calcined clays, titanium dioxide, finely divided silica, talc, and mixtures thereof.
8. A sheet product according to claim 7, in which the pigment is calcium carbonate.
9. A sheet product according to any one of claims 1 to 8, in which the particle size of the pigment is in the range of from 1 to 10 microns.
10. A sheet product according to any one of claims 1 to 9, in which the binder is a synthetic rubber latex, a styrene acrylic latex, or an ether derivative of starch.
11. A sheet product according to any one of claims 1 to 10, in which the coat weight of the pigment/binder layer is in the range of from 2 to 10 g/m².
12. A carbonless copy paper set which includes at least a CB sheet and a CF sheet, in which the CB sheet is a sheet product as claimed in any one of claims 1 to 11.
13. The use of a coating comprising a pigment and a binder and having characteristics such that when used in a sheet product as claimed in any one of claims 1 to 11.

application of the droplets of colour former solution; said use being to reduce curl following printing of the sheet product using an electrophotographic printer.

- 5 14. The use according to claim 13, in which the pigment/binder coating has the characteristics of any one of claims 1 to 11.

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.